

# THE STUDY ON *IN VITRO* DIGESTIBILITY OF SOAKED PALM OIL FIBER BY FILTRATED PALM OIL FRUIT BUNCH ASH

ARI L. DARMAWAN, ASEP IRAWAN, TIDI DHALIKA, ANA R. TARMIDI, MANSYUR, ATUN BUDIMAN, KURNIA A. KAMIL AND IMAN HERNAMAN

FACULTY OF ANIMAL HUSBANDRY, UNIVERSITAS PADJADJARAN  
Jl. Raya Bandung-Sumedang, Km 21, Jatinangor – Sumedang  
e-mail : iman\_hernaman@yahoo.com

## ABSTRACT

Palm oil fiber has its potency as feed fiber source for ruminant, but contains high lignin and causes limited digestibility. This research was carried out to find the effect of soaking palm oil fiber in filtrated palm oil fruit bunch ash (FPOFBA) on *in vitro* digestibility. This experiment used a completely randomized design that repeated for 4 times. Palm oil fruit bunch ash was mixed in water and entered into container for 24 hours within concentrations, consists of: 50, 100, 150 and 200 g/L. Moreover, this filtrate used to soak palm oil fiber for 3 hours. The processed products were analyzed for their level of lignin and crude fiber. Meanwhile, *in vitro* test was used to measure digestibility. It showed that soaking in filtrated palm oil fruit bunch ash gave significant effect to decrease level of lignin and crude fiber ( $P < 0.05$ ), and without soaking to improve digestibility of dry and organic matter compared to control treatment ( $P < 0.05$ ). Treatment with 150 g/L and 200 g/L using filtrated palm oil fruit bunch ash produced low level of lignin ( $P < 0.05$ ), as of: 17.25 and 18.53%. In contrast, within concentration of 150 g/L produced higher level of crude fiber compared to 200 g/L (46.04 vs. 43.87%). This seemed to have the same results in digestibility of dry and organic matter ( $P > 0.05$ ), such as 23.48 and 24.12% as well as 16.70 and 17.06 % in each. It can be concluded that soaked palm oil fiber with 150 g/L concentration of filtrated palm oil fruit bunch ash was more effective in improving digestibility.

*Keywords:* ash, crude fiber, digestibility, lignin, and palm oil

## INTRODUCTION

Processing of palm oil fruit becomes crude palm oil (CPO) will produce palm oil fiber as feed ruminant. According to Jalaludin *et al.* (1991) in 1 ton of palm oil fruit could produce 180-260 kg of palm oil fiber. This amount is equal to 5.060 kg palm oil fiber in each hectare per year. Palm oil fiber contains high fiber but low protein, each consists of: 46.1 and 6.2% (Mathius, *et al.* 2003). However, oil palm fiber contains lignin as high as 12.91%-21.92% (Irawadi *et al.* 1996; Suharto, 2004). Lignin bound cellulose and hemicellulose which difficult to be broken until low level of digestibility (Komar, 1984).

An effort to break the bounding of lignocellulose and lignohemicellulose conducted with alkali compound (Komar, 1984). Alkali has its potency to process palm oil fiber which is obtained from ash that dissolved with water. Filtrate of cacao ash could improve organic matter digestibility of corn straw to goat (Adebowale, 1985).

Palm oil fruit bunch ash yields abundant. Currently, it has been exploited for fertilization of palm oil plants. Mineral composition of palm oil fruit bunch ash, consists of: Kalium (K) 25.8%; Natrium (Na) 0.03%; Calcium

(Ca) 2.7%; Magnesium (Mg) 2.8%; Chlor (Cl) 4.9%; Carbonate ( $\text{CO}_3$ ) 9.2%; Phosfat (P) 0.2%; Silica ( $\text{SiO}_2$ ) 19.1% (Zahrina, 2007). It can be analyzed that palm oil fruit bunch ash has high level of alkali. In consequences, it can be used to process palm oil fiber if dissolved in water and expected to improve digestibility.

## MATERIALS AND METHODS

Palm oil fruit bunch ash in each treatments, as of: 5 (T2), 10 (T3), 15 (T4), and 20 g (T5) poured into container and mixed with 100 mL of water. Mixture precipitated for 24 hours and filtered with Whatman No. 41 paper and obtained filtrated palm oil fruit bunch ash/FPOFBA (g/L). Then, 100 g palm oil fiber were mixed with FPOFBA according to its treatment. After that, they were poured into plastic bag and tighten for soaking approximately about 3 hours in room temperature. Hydrolyzed result was dried to test level of crude fiber (AOAC, 1991), lignin (Van Soest, 1967) and *in vitro* digestibility (Tilley and Terry 1963). The whole treatments were compared to control (palm oil fiber/T1). This experiment was using a completely randomized design and collected data were analyzed with Duncan's test (Steel and Torrie, 1983).

## RESULTS AND DISCUSSION

The results indicated that processing palm oil fiber with FPOFBA degraded level of lignin (Figure 1). FPOFBA has a high level of alkalinity at 9.73–9.84 pH. Basically, alkali works: (1) to break the bounding between cellulose and hemicellulose with lignin and silica, (2) to esterify acetyl group to form uronic acid, and (3) to break cell wall structure by developing of fiber network in which facilitate penetration by microorganism enzyme molecule (Komar, 1984). Processing of dry *Sorghum plumosum* grass var. Timorensis was soaked by filtrate of rice hull ash at concentration of 15% for 1.5 hours decreased 20.28% level of lignin (Dato, 1998).

The same result indicated that crude fiber of palm oil fiber was lower than after being soaked with FPOFBA (Figure 2). This condition was caused by the existence of decreasing level of lignin compound. Lignin was crude fiber component and decreasing lignin level caused by degraded level of crude fiber of palm oil fiber. Meanwhile, other crude fiber components such as cellulose and hemicellulose lose due to dissolved in FPOFBA. According to Anggorodi (1984), crude fibers are cellulose and hemicelluloses, insoluble in water but dissolve in watery alkali and break in watery acid. Suwandiyastuti *et al.* (1984) reported that damping of rice straw with 3% solution NaOH and using 10% filtrate of rice hull ash that enriched with 4% urea, 0.2% brimstone, 1.8% salt, and 1% lime could degrade level of crude fiber of rice straw as high as 1.7% and 2%.

At Figure 2, indicated that processing with FPOFBA could increase digestibility of dry and organic matter with the highest result obtained in treatment T3 and T4 (23.48 versus 24.12% and 16.70% versus 17.60%). Hydrolysis activity by FPOFBA could break its bounding marked by decreasing level of lignin. In consequences, enzyme cellulase and hemicellulase produced by bacterial rumen could degrade cellulose and hemicelluloses and improve digestibility. Sutrisno *et al.* (1986) reported that processing of rice straw using filtrate of rice hull ash could increase digestibility coefficient. Ismadi (1990) conducted a research on bagasse that was splashed with 20 % filtrate of rice hull ash, then covered tightly and soaked for 21 days. It showed that there was a degradation of fiber composition, except silica and improvement of its digestibility compared to control.

Soaked palm oil fiber by 150 g/L concentration of filtrated palm oil fruit bunch ash was more effective to increase digestibility.

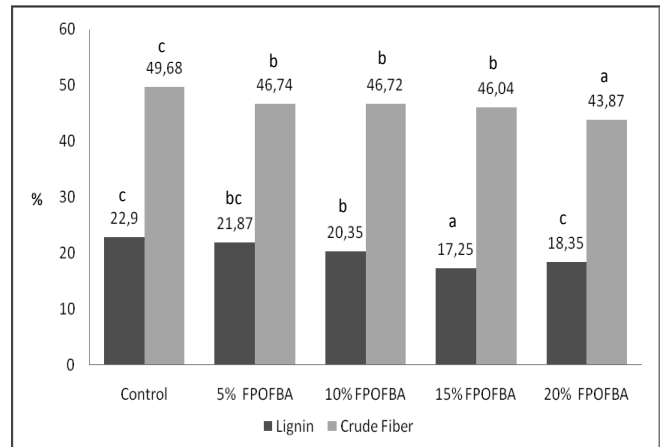


Figure 1. The Effect of Soaked of Palm Oil Fiber by FPOFBA on Lignin and Crude Fiber

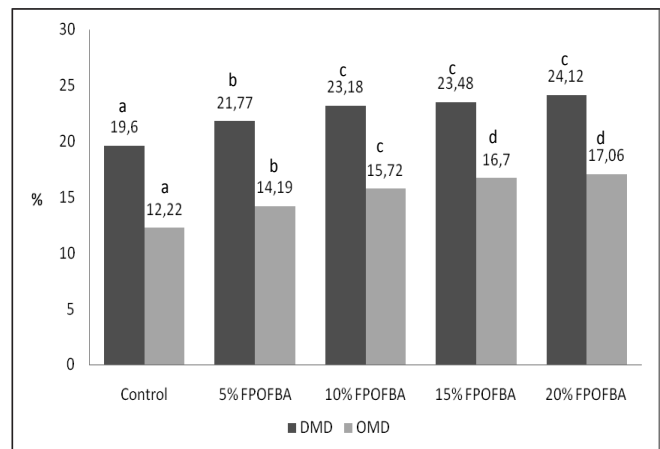


Figure 2. The Effect of Soaked of Palm Oil Fiber by FPOFBA on Dry Matter Digestibility (DMD) and Organic Matter Digestibility (OMD) In Vitro

## REFERENCES

- Adebawale, E. A. 1985. Organic Waste Ash as Possible Source of Alkali for Animal Feed Treatment. *Animal Feed Science and Technology*.
- Anggorodi, R. 1994. Ilmu Makanan Ternak Umum. PT Gramedia Utama, Jakarta.
- Association of Official Analytical Chemists (AOAC). 1980. *Official Methods of Analysis Association of Official Analytical Chemists*. 13<sup>th</sup> Edition.
- Dato, T. O. D. 1998. Pengolahan Rumput *Sorghum plumosum* var. Timorensis Kering dengan Filtrat Abu Sekam Padi terhadap Perubahan Komponen Serat dan Kecernaannya secara *In Vitro*. Tesis. Program Pascasarjana Universitas Padjadjaran, Bandung.
- Irawadi, T. T., Sailah, I., Chaniago, T., dan Winugroho. 1996. Pemanfaatan Limbah Serat Pengolahan Kelapa Sawit untuk Produksi Enzim Pemecah Bahan Lignoselulosik dan Produksi Pakan Ternak. Laporan Riset Unggulan Terpadu II. Kerjasama Pusat Antar Universitas Bioteknologi Institut Pertanian Bogor dengan Direktorat Riset Negara dan Puspitex, Bogor.

- Ismadi, V. D. Y. B. 1990. Peningkatan Manfaat Ampas Tebu melalui Pengolahan dengan Larutan Abu Sekam Padi, Urea, dan Sumber Urease sebagai Bahan Pakan yang Diberikan pada Domba. *Tesis*. Program Pascasarjana Universitas Padjadjaran, Bandung.
- Komar, A. 1984. Teknologi Pengolahan Jerami sebagai Makanan Ternak. Yayasan Dian Grahita, Bandung.
- Mathius, I W., Sitompul, D., Manurung, B. P., dan Asmi. 2003. Produk Samping Tanaman dan Pengolahan Buah Kelapa Sawit sebagai Bahan Dasar Pakan Komplit untuk Sapi: Suatu Tinjauan. *Prosiding*. Lokakarya Nasional: Sistem Integrasi Kelapa Sawit-Sapi. Bengkulu 9-10 September 2003.
- Steel, R. G. D., dan Torrie, J.H. 1993. Prinsip dan Prosedur Statistika. PT. Gramedia Pustaka Utama.
- Sutrisno, C. I., Soelistyono H. S., dan Slamet W., 1986. Potensi Kualitatif dan Kuantitatif Makanan Ternak Ruminansia Besar dalam Kaitannya dengan Efisiensi Usaha Ternak. Dalam: Mukernas III PPSKI, Salatiga.
- Tilley, J. M. A. and Terry, R. A. 1963. A Two Stage Technique for In Vitro Digestion of Forage Crops. *J. British Grassland* Vol 18.
- Van Soest, P. J. 1967. Development of a Comprehensive System of Feed Analysis and Its Application to Forages.
- Zahrina. I. 2007. Pemanfaatan Abu Sabut dan Cangkang Sawit sebagai Sumber Silika pada Sintesis ZSM-5 dan Zeolit Alam. *Jurnal Sains dan Teknologi* 6. (2).